BRITISH JOURNAL OF
TUBERCULOSIS
AND DISEASES OF THE CHEST

Vol. XLIV. October, 1950 No. 4.

EDITORIAL

THE assumption of the editorship of the BRITISH JOURNAL OF TUBERCULOSIS AND DISEASES OF THE CHEST in succession to three distinguished predecessors carries with it much responsibility and sets a high target of achievement.

It may be of interest to recall that this, the oldest of the specialist journals on thoracic disease, was founded by Dr. T. N. Kelynack in 1907, when its scope was largely confined to tuberculosis. It has since been extended to include all diseases of the chest, and has been brought to this high level by Dr. L. S. T. Burrell and, following his unexpectedly early death, by Dr. Clifford Hoyle in whose able hands it has become a vehicle for presenting to the British Empire and foreign countries current British work in diseases of the chest, including tuberculosis.

In accepting the invitation to become editor I am keenly aware of the standards to be reached. I am particularly fortunate, however, in having still available Dr. Hoyle's experience and knowledge on the Editorial Board which has recently been constituted. Other distinguished representatives on this board are Professor C. Cameron, Professor of Tuberculosis in the University of Edinburgh, as a representative for the north, and Dr. Brian Taylor of Birmingham for the Midlands. London is ably represented by two members, a physician and a thoracic surgeon—namely, Dr. Hoyle and Mr. T. Holmes Sellors.

It is hoped that in due course representative colleagues from the Dominions will give us the benefit of their different and broadening experience.

An editorial foreword has not been the recent practice of this Journal but in view of the change in Editorship its appearance in this instance would seem justifiable.

P. E.

GENERAL ARTICLES

ATYPICAL TUBERCULOSIS
A CASE AND A DISCUSSION

By CHARLES CAMERON

From the Department of Tuberculosis, University of Edinburgh, and Southfield Sanatorium, Edinburgh

T.P. was admitted to Southfield Sanatorium on July 20, 1948. He was aged 13 and his history was as follows.

He was a normal child until the age of 7. The story during the following two years is one of general ill-health, with loss of appetite and energy as the chief symptoms. He continued to attend school. When he was 10 his mother became worried by the persistence of his symptoms and took him to a doctor. He was then suffering from loss of weight, breathlessness, and fever. The doctor found that his abdomen was swollen and put him to bed for a period of six weeks. The symptoms subsided and he went back to school; but he did not feel well and their early recurrence brought him under observation again. There was now also swelling of the feet. He was sent to the Royal Hospital for Sick Children, Edinburgh, for X-ray examination and was admitted for investigation. That was in 1945. Rest in bed again led to disappearance of the symptoms and he was sent home after a stay of two months. He felt much better and resumed ordinary activity. He was brought back to the hospital at intervals for observation until the end of 1946 when he was again admitted with a recurrence of fever, breathlessness, and swelling of the abdomen and feet. He now had, in addition, distension of superficial abdominal veins. After his discharge early in 1947 he developed pallor and numbness of his hands and feet. Ulceration of the index and middle fingers of the right hand, of both great and both small toes, of the outer aspect of both ankles, and of the lower third of the legs appeared, and he was re-admitted to hospital for a further period of six weeks. During this time the abdominal venous distension was very prominent and he was seen on several occasions by Sir James Learmonth, who later (June 1948) admitted him to Ward 7 of Edinburgh Royal Infirmary. During one of his periods in the Royal Hospital for Sick Children a tentative diagnosis of adhesive pericarditis had been made, but that diagnosis was discarded after detailed investigation. He failed consistently to give a reaction to the Mantoux test.

When he was admitted to Sir James Learmonth's ward he was in poor condition and he was very weak. The temperature was 101° F., the pulse rate was 100, and the blood pressure was 105/80 in the arms and 130/95 and 125/88 in the left and right legs. The abdomen was distended and a superficial network of dilated veins was visible. The liver was enlarged and smooth and

PLATE IX

FIG. 1.—PHOTOGRAPH SHOWING NETWORK OF DISTENDED VEINS ON FRONT OF ABDOMEN AND CHEST WALL. TAKEN SHORTLY AFTER ADMISSION.

To face page 84

FIG. 2.—PHOTOGRAPH SHOWING AREA OF GANGRENE AT TIP OF LEFT GREAT TOE. THIS PHOTOGRAPH ALSO GIVES AN IMPRESSION OF THE HYPERTROPHY AND BULBOUS EXPANSION OF THE TOES. IT ALSO SHOWS THE SCAR OF PREVIOUS ULCERATION ON THE TIP OF THE RIGHT GREAT TOE.

FIG. 3.—PHOTOGRAPH SHOWING AREA OF GANGRENE AT TIP OF RIGHT MIDDLE FINGER. THE PHOTOGRAPH ALSO GIVES AN INDICATION OF THE MUSCLE WASTING PRESENT IN THE HANDS.

PLATE XI

FIG. 4.—POSTERIOR ANTERIOR FILM OF THE CHEST. SHOWS THE PRESENCE OF GLANDULAR MASSES PROJECTING FROM THE RIGHT MEDIASTINAL BORDER AS DESCRIBED IN THE TEXT.

PLATE XII

FIG. 5.—LATERAL FILM. SHOWS THE GLANDULAR MASSES LYING AROUND THE TRACHEA AND BRONCHI.

To face page 85

the spleen was just palpable. There was no free fluid. Chemical investigation of the blood revealed no abnormality. Other detailed investigations revealed only slight impairment of liver function. A venogram after the injection into the long saphenous vein of the right leg of 15 c.c. of 50 per cent. Abrodil showed filling of the external and common iliac veins and of collateral venous channels. The dye did not enter the vena cava. Sir James Learmonth did not accept this as final evidence of inferior vena cava obstruction. On June 27, 1948, he exposed by an extra-peritoneal approach the junction of the right common iliac vein and the inferior vena cava. The junction was overlapped by a mass of soft glands. A portion of the mass was dissected from the vessels and the inferior vena cava was seen to be patent. Enlarged glands lay along the course of the aorta. A biopsy specimen was then taken from the liver, which was enlarged, granular in appearance, soft, and had a sharp edge. The spleen was enlarged to about one and a half times its normal size. Histological examination of the excised gland tissue showed mixed tuberculous and chronic non-specific inflammatory changes. The diagnosis of the liver specimen was active common cirrhosis. The patient was transferred to Southfield Sanatoriun on July 20, 1948.

Condition on Admission.—He was pallid, emaciated, and in very poor general condition. The temperature ranged between 100° and 103° F. and the pulse rate was 108. The abdomen was greatly distended and two small areas of the operation scar were unhealed. The liver was palpable 3 inches below the right costal margin. The area of splenic dullness was increased, but the organ could not be felt. The abdomen contained free fluid, and there was gross superficial venous distension. The dilated veins began in the lower abdominal and lumbar areas and spread in a network over the lateral chest wall to form a dense pattern over the front of the chest. The flow was in an upward direction, and those in front drained into the first and second intercostal spaces (Fig. 1). The venous network posteriorly was less dense and drained into the tenth and twelfth intercostal spaces. Both legs were swollen and firm. There was no superficial œdema and no tenderness. The feet were swollen and livid, and there was an area of dry gangrene on the tip of the left great toe (Fig. 2). A similar area of gangrene was present on the tip of the right middle finger (Fig. 3). The other toes and fingers were livid and cold. Flat scars of previous ulceration were present over and above each lateral malleolus, on the dorsum of the left foot behind the base of the small toe, and on the tip of the right great toe. Small firm glands were present in each posterior neck triangle extending from the clavicle to the mastoid process. Similar glands could be felt on the medial wall of each axilla and in each groin. The chest was thin but symmetrical. It was resonant and the breath sounds were of normal intensity and quality. Many fine crepitations were heard at each lung base.

X-ray examination of the chest (Figs. 4 and 5) showed a large dense mass with an irregular margin bulging from the right mediastinal border. The mass had the appearance of dense glands. It involved the whole of this border and extended to the diaphragm. The heart was of normal contour and size but the right border was partly obscured by the glandular swelling. Screening showed pulsation of small volume and the position of the heart did not change when he was tilted from side to side.

Blood examination yielded the following results:

R.B.C. 5,080,000
W.B.C. 9,600
Hb. 62 per cent. (Gowers)
C.I. 0·6

There was a slight degree of anisocytosis and poikilocytosis. Reticulocytes were less than 10 per cent. and a differential white cell count showed:

Neutrophil polymorphs	65 per cent.
Eosinophil polymorphs	4 per cent.
Monocytes	16 per cent.
Large lymphocytes	8 per cent.
Small lymphocytes	7 per cent.

There was no excess of urobilinogen in the urine. The *serum icteric index* was 5 and the *total serum proteins* were 7·9 gm. per cent., consisting of albumen 3·7 and globulin 4·2. The blood *Wassermann test* was negative.

He was given iron by mouth. The response was slow but six weeks later the hæmoglobin had risen to 78 per cent. The white cells then numbered 9,600 and the differential count showed 5 per cent. of eosinophils and 6 per cent. of monocytes. The serum proteins were now albumen 4·6 gm. per cent. and globulin 2·3 gm. per cent.

Clinical State and Investigations made in Sanatorium.—During this period he failed on three occasions to give a skin reaction to a *Mantoux test* performed with a dilution of 1-100 old tuberculin.

Three months after admission his condition was generally better. He remained thin and the state of his fingers and toes was unchanged. The venous distension and enlargement of the liver were unaltered, but the abdomen was less distended. The temperature, which at the time of admission ranged from 100° to 103° F., settled about two weeks later to a steady range of 99° to 102·5°F. and at the end of four weeks it ranged between 99° and 101° F. On September 11, 1948, it began to rise and reached a fastigium of 104° F. on September 16. This was maintained for ten days and it then fell gradually to its old level, which was reached on September 26. This was maintained for three days and then another rise set in (October 1) which reached an evening maximum of 104·8° F. on October 10. The rise which started on September 16 followed a series of three Mantoux tests (1-10,000, 1-1,000, and 1-100 old tuberculin) performed on September 7, September 10, and September 12 respectively. None had given a positive skin reaction. The rise on October 1 followed intracutaneous (Mantoux) injections of 1-10,000 old tuberculin made into the right forearm and abdominal wall on September 27 and September 28 respectively. The association of the wave of fever with the Mantoux tests was noted at the time, and similar waves of lesser amplitude followed tuberculin tests on two later occasions. On May 8, 1949, while I was inspecting the site of two recent tests, both of which were mildly positive (1-10,000 and 1-1,000 old tuberculin) and to which reference will be made later, he informed me that after each of the many tuberculin tests preceding these last two he had felt listless and tired for several days. After the last two tests which gave mildly positive skin reactions there was no systemic disturbance. He had associated

the temperature and general disturbance with the injections. The tests had never been discussed in his presence and his observations were confirmatory of my own. Meantime a culture of scanty sputum had been negative for tubercle bacilli.

On January 19, 1949, he was given an intracutaneous *injection of 0·001 mgm. of a young culture of the vole tubercle bacillus* suspended in 0·1 ml. of fluid. There was no immediate reaction of any kind. He was then in an improved condition and the temperature was steady between 98° and 100° F. The *B.S.R.* was 100 (Westergren). It had never been less than 56. The gangrenous tips of the affected great toe and ring finger were undergoing separation and the circulation of the extremities had improved. The liver enlargement and venous distension persisted.

On March 8, 1949, seven weeks after the injection of the vole bacillus suspension, he was tested again with 1-1,000 old tuberculin. There was no reaction of any kind. Repetition of the test on April 29 with 1-10,000 old tuberculin gave rise ten days later to a small dark red nodule of a diameter of 5 mm. This was accepted as a positive reaction. (The long gap between the tests of March 8 and April 29 was due to inadvertence.) He had thus undergone conversion at some period between seven and thirteen weeks after the vole bacillus injection. The test was repeated on May 30 with 1-1,000 old tuberculin and gave rise to a small raised white area (5 mm.), the appearance of which suggested that the tuberculin had remained unabsorbed in the superficial layers of the skin. Five days later the raised area had disappeared, leaving a small patch of brownish discoloration. He had again, from the skin point of view, become tuberculin negative.

On August 13, 1949, he was given a *second intracutaneous injection* (0·1 ml.) *of vole bacillus* suspension containing 0·01 mgm. of the organism. A small pink papule, 3 mm. in diameter, formed forty-eight hours later but disappeared within a few days. A Mantoux test (1-10,000) on August 25 was negative. On September 13, thirty days after the injection, a small dusky papule appeared at the site of the injection. Tuberculin tests (1-10,000 and 1-1,000) were negative on October 22, 1949, December 3, 1949, January 4, 1950, and February 4, 1950. Meantime the papule at the site of the vole bacillus injection had formed a small granulating scar. The granulations were excised on March 9 and sent to Professor Murray Drennan's department for pathological examination. The report by Dr. A. Colin Campbell stated that the specimen " shows a chronic inflammatory reaction of tuberculoid type with many small endothelioid cell follicles and many Langhans giant cells. There is no caseation and little or no fibrosis. Ziehl-Neelsen stain shows a single acid-fast bacillus, morphologically indistinguishable from a tubercle bacillus, within a giant cell. Histologically the reaction is, I think, indistinguishable from that of tuberculosis. One rather atypical feature is the presence of giant cells lying singly quite apart from endothelioid cell follicles, but I should not lay great stress on this." The provisional diagnosis given was " atypical tuberculosis." He was tested on April 16, 1950, with 1-100 old tuberculin and the result was again negative.

On April 28, 1950, he was given in the left deltoid area an intracutaneous *injection of 0·1 ml. of B.C.G.* (Danish strain). Forty-eight hours later the in-

jection site showed an area of erythema 12 mm. in diameter containing a central area of induration. At seventy-two hours the induration measured 6 mm. and showed slight superficial ulceration. I accepted this as an immediate reaction. During the fourth week after the inoculation a black scab formed. The papule was thus regressing at a time when a normal B.C.G. papule would have been in course of evolution. The appearance then changed slightly and regression became slower. Ten weeks after the injection the site was marked by a flat healed scar. On June 20, 1950, less than eight weeks after the vaccination, the Mantoux reaction to 1-100 old tuberculin was positive (5 mm.). This test was repeated on July 14, ten and a half weeks after the injection, and gave a typical positive reaction with an area of pallid induration of 8 mm. and a zone of bright surrounding erythema.

Soon after his transfer to the sanatorium Sir James Learmonth kindly lent me the slides which had been prepared from the gland and liver tissue removed at operation, and I asked Dr. E. K. Dawson of the Royal College of Physicians Laboratory, Edinburgh, to give an opinion on them. Dr. Dawson has been interested in sarcoidosis and that condition was in my mind when I made that request. Dr. Dawson reported: " It shows what I think can only be regarded as a tuberculosis picture, but a very atypical one, with sparsely and irregularly scattered follicles of very varying diameter, some consisting only of minute rounded aggregations of endothelioid cells, others very large. No caseation necrosis characteristic of the typical tuberculous lesion, but a number of follicles show a minute central abscess area, of polymorphs or possibly of disintegrating eosinophils. Some follicles show numerous giant cells in various stages of formation; others show none, though there may be a giant cell isolated outside the follicle. One or two follicles show almost hyalinisation. Normal lymphoid tissue is preserved to a considerable extent, centrally and peripherally, but some areas show replacement by a diffuse amorphous reticulosis with many plasma cells. Throughout there is an unusual number of eosinophils. They may even be picked up inside the blood vessels. There are several features in this picture suggestive of the accepted sarcoidosis lymph node appearances, and that seems the best explanation if it can be correlated with the clinical findings; but it is not a typical picture unless it be the acute phase, which is very rarely observed."

Dr. Dawson also reported on the liver tissue as follows: " Shows a mild fibrosis of subacute type, or reticulosis. The cytological picture is difficult to interpret. It might be an early fibrosis with very plump fibroblasts or a diffuse reticulosis of mild toxic origin. There are no follicles and no giant cells. The reactive tissue is most evident under the liver capsule. There is no apparent liver regeneration and only a slight degeneration of the liver cells. Bile-duct tissue is perhaps more prominent than usual because of the mild diminution of liver tissue by the new fibrous or reticular bands. As in the lymph nodes, there are eosinophils and some plasma cells as well as lymphocytes scattered in the reactive tissue. It is again an unusual picture, certainly not definitely tuberculosis, though this may be the explanation of the cellular reactive tissue which on the whole is endothelioid rather than merely fibroblastic."

Serum-protein estimations were made on four occasions. On the first, immediately after admission, the globulin exceeded the albumen, and the

total protein was 7·9 gm. per cent. On the second, a month later, the ratio was albumen 2, globulin 1, and the total was 6·9 gm. per cent. Ten months later the ratio was 1 : 1 in a total of 7·7 gm. per cent., and in July, 1950, thirteen months later, the ratio was again 1 : 1 with a total of 7·4 gm. per cent.

Discussion

The discussion revolves principally around the question of diagnosis. It seems clear from the distribution of the *dilated superficial venous channels* that there is an obstruction of the inferior vena cava. The anterior veins discharge principally through the second intercostal spaces anteriorly. The posterior discharge through the tenth and eleventh intercostal spaces posteriorly. The abdominal portion of the vena cave was seen at operation to be free from obstruction, and the distribution of the veins suggests that the obstruction has formed immediately above the diaphragm. It is very probable that it is related to the dense masses of glands which are shown in the X-ray film and which are presumably similar to those seen at operation in the retro-peritoneal space. Whether the obstruction is due to pressure, or to actual invasion of the vein by the diseased gland process, is a matter of speculation.

The principal interest lies in the diagnosis of *the diffuse gland disease* and it can be accepted now that, whatever doubt there was at first, constrictive pericarditis is not present. It is tempting to accept at once the diagnosis of *sarcoidosis* which is suggested by the histological examination of gland tissue and by the atypical appearances of the granuloma which developed at the site of the second vole bacillus injection. That would explain the cutaneous anergy which is such a common feature of sarcoidosis; but there are certain points in this which require consideration.

Skin sensitivity in tuberculosis is generally accepted as being representative of tissue sensitivity generally. It is probable that in the majority of cases that is true, but it is well recognised that the skin may be anergic while other tissues are allergic. The periods of fever and malaise which followed the early tuberculin tests suggested a general body reaction, and after his skin became temporarily sensitive to tuberculin following the first injection of the vole bacillus vaccine the general disturbance disappeared, presumably through fixation of the tuberculin at the point of injection. The question of anergy of the skin in the presence of tuberculous disease is discussed by Pinner (1945), Andenaes (1945), Cameron and Purdie (1946), Thomassen (1947), Ustvedt and Aaronsen (1949). The cutaneous anergy which is present in about 70 per cent. of cases of sarcoidosis is discussed widely in the literature and discussion is intimately related to the similarity of the histological lesions in the two diseases. The view is gaining ground that sarcoidosis is a form of tuberculosis, modified not by any peculiarity of the organism but by the tissue defence reactions of the individual. Many cases of sarcoidosis show radiographical evidence of previous tuberculosis, often calcified, while others ultimately develop caseating tuberculosis from which they die. Hoyle (1947) has discussed this question succinctly and critically. "The separation of sarcoidosis from tuberculosis on histological grounds," he states, " would be more convincing if it had been shown that tuberculosis was incapable of producing lesions with a sarcoid pattern. . . . However we view the disease—whether from its clinical appearances and

course, its radiology, its morbid histology, or its intractability to transmission—the similarity to known examples of tuberculosis is a constantly recurring feature."

The absence of a positive tuberculin skin reaction thus neither proves the absence of tuberculosis nor the presence of sarcoidosis, as an appreciable percentage of patients with sarcoidosis react in some degree to the tuberculin test. The transition from tuberculosis to sarcoidosis, and *vice versa*, has been recorded frequently (Rubin and Pinner, 1944; Pinner, 1945; Cameron and Dawson, 1946), but I have not found any record of what might be called an intermediate stage in the transition, although Reisner (1944) mentions " atypical cases occupying a borderline position between sarcoidosis and tuberculosis." Lemming (1940) has recorded cases of sarcoidosis which reacted to intracutaneous injection of B.C.G. with a sarcoid histological reaction, and Warfvinge (1945) has described a histologically specific skin reaction in sarcoidosis produced by intracutaneous injection of dead tubercle bacilli corresponding macroscopically and microscopically to the Kveim's reaction. This latter reaction is produced by an antigen prepared from sarcoid tissue. The epithelioid tubercles which are characteristic of the disease are, in his opinion, probably produced by products of disintegrating tubercle bacilli. In this connection it is interesting that the granuloma which followed the second injection of vole bacillus vaccine was classed by the pathologist as atypical tuberculosis. Furthermore, Dr. Dawson in her report on the abdominal gland section called attention to features suggestive of, but not typical of, sarcoidosis and stated that the condition could be regarded only as a tuberculosis picture, but a very atypical one.

The diagnosis of tuberculosis must thus be accepted, and the high fever and extreme weakness which were present at the time of admission to the sanatorium indicated activity of the disease. The swinging temperature was in fact suggestive of progressive caseation. The atypical histological features of the disease had a parallel in the peculiar behaviour of the skin to tuberculin. Sensitivity was established by the first injection of vole bacillus (0·001 mgm.), but disappeared within a few weeks. It was not restored by a later injection of 0·01 mgm., although that gave rise to a small granulomatous ulcer which was proved histologically to be tuberculous. Fifteen months after the first of these injections the patient was given an intracutaneous injection of B.C.G. vaccine. He responded with an immediate reaction and the papule at first followed the course which is typical of vaccination of infected persons with B.C.G. (Andenaes, 1945), or with vole bacillus vaccine (Cameron and Purdie, 1946). The rate of evolution of the papule then became slower, and in the later stages it behaved very much like the papules produced by vaccination of tuberculin-negative persons. Eight weeks after the injection the tuberculin skin reaction to 1-100 old tuberculin was definitely positive. It was thus possible on two occasions to alter skin sensitivity. The interest of the second occasion lies in the fact that he was found to react to B.C.G. at a time when he failed to react to tuberculin. He was, in fact, tuberculin-negative and tubercle bacillus-positive; and this injection of B.C.G. effected for the second time conversion of the tuberculin reaction.

Alterations in the percentage of *blood eosinophils and monocytes* have been

described in sarcoidosis. In this case the percentage of these cells was persistently at the upper level of normal. On one occasion soon after his admission there was a reversal of the *serum albumin-globulin ratio*, and on two other occasions the ratio was disturbed. This has been described in sarcoidosis, but it is found in other diseases, and in this case there was an explanation in the evidence of *interference with liver function* provided by two hippuric acid excretion tests performed in the sanatorium, and by lævulose tolerance and cephalin flocculation tests performed while he was under the care of Sir James Learmonth.

Enlargement of liver and spleen is a fairly common feature of sarcoidosis, and, in fact, liver puncture is one of the recognised exploratory methods of diagnosis. Schaumann (1936) describes the liver as showing a tendency to degenerative alteration resulting in a cirrhosis. He calls attention to the relatively small size, and to the sparseness, of the epithelioid foci. It is probable, however, that the explanation in this case is the inferior vena cava obstruction and that the cirrhosis is analogous to the cirrhosis which sometimes follows the long-continued congestion of cardiac valvular disease.

I was at a loss to account for the *areas of peripheral gangrene* present on one toe and one finger, and the scars of previous ulceration of feet and ankles. He had been in bed for a long period, and vasospasm precipitated by cold seemed to be an unsatisfactory explanation. His emaciated condition, the secondary anæmia, and the impaired liver function were all potential predisposing causes of vasospasm, but it was difficult to believe that they would cause the condition at a time when his temperature each evening was above 103° F. and even in the morning was above normal. Some patients with deficient circulation of the pernio type—that, of course, was not his condition—improve with calcium, and as his principal disease was glandular tuberculosis I decided to try the effect of calciferol. The drug was started on November 20, 1948, and was increased rapidly to a daily dose of 100,000 units. It was stopped on January 29, 1949. He was then drowsy, thirsty, and generally unwell and his blood urea had risen to 60 mgm. per cent. The serum calcium level was not affected. By this time the circulation of the extremities was much better. The gangrenous tip of the great toe separated two months later, and two months after that the gangrenous finger-tip came off. Healing of both thereafter was rapid. There was little corresponding change in his general condition.

At the 44th Annual Meeting of the Association of Physicians of Great Britain and Ireland, Drs. F. H. Murgatroyd and B. E. Schlesinger demonstrated a case of old-standing abdominal tuberculosis showing widespread calcification on the X-ray film and trophic finger changes. In reply to my request for further information about the case Dr. Schlesinger sent me a résumé of the history, and prints of the X-ray films of the chest and abdomen and of a photograph of the hands. This remarkable case showed features of similarity to the present case. The vascular condition which had led to the loss of large portions of two fingers and ulceration of a third was diagnosed as obliterative arteritis.

Present Condition.—He improved generally during his stay in the sanatorium and at the time of preparation of this report (July, 1950) he looks and feels well, but he is very thin. He has no complaints of any kind, but his temperature shows a big daily swing from between 97° and 98° F. in the morning to between

99° and 99·8° F. in the evening. The B.S.R. (Westergren 1 hour) is 49. The anæmia has disappeared. The red cells number 4,680,000, the Hb. is 90 per cent. (Gowers) and the white cells are 9,000. The percentage of eosinophils is 4, and of monocytes 10. There are small palpable glands in the areas mentioned at the time of his admission. The liver is enlarged to the same extent, and the network of distended venous channels is unchanged. The total serum protein is 7·4 gm. per cent.; albumin is 3·8 gm. per cent. and globulin 3·6 gm. per cent. The blood cholesterol is 121 mgm. per cent. The cephalin cholesterol flocculation test is negative, and the hippuric acid excretion test gives a reading at 4 hours of 1·5 gm. The legs are swollen and firm with deep œdema. The blood pressure in the arms is 105/85. In the legs it is R. 130/90, L. 125/85. The fingers are slightly livid, but they are warm and comfortable and blanching in cold weather no longer occurs. The toes are long and their tips are bulbous (clubbing) and livid. Attempts to allow him up have led to increased swelling of the legs and to petechial extravasations in the skin of the buttocks and legs. Many crepitations persist at the lung bases, and the X-ray and screening appearances of the heart and lungs are unchanged. He weighs 4 st. 11 lb. and his height is 4 feet 9 inches. The firm œdematous legs give an appearance of sturdiness which is belied by his general emaciation. There has appeared within recent months a painless synovial swelling of the right wrist joint. The movements of the joint are not impaired, but an X-ray film of both hands and both wrists shows very well-marked decalcification of the metacarpals and phalanges of the right hand and thinning of the cortex of these bones. The wrist-joint appearances are normal. One can say that he has improved during these two years of observation and treatment, but that the disease process is still active. The venous obstruction is permanent.

Conclusion.—An attempt has been made to discuss the features of a case which shows much of clinical interest. I hesitate to use the word " atypical," which has been abused in its application to other diseases, but perhaps its use here is justified. The tuberculous process follows in the great majority of cases a more or less uniform course. That is typical tuberculosis, and it is probably true to say that until within the past few years that was the only course recognised in English-speaking countries. The increasing recognition of sarcoidosis with its many manifestations and its intimate relationship to tuberculosis has broadened our conception of the tuberculous process. It has at any rate led to our recognition of the possibility of its modification by varying states of body resistance. The histological picture of sarcoidosis has a certain uniformity, and its resemblance to typical tuberculosis—and its points of difference—is well recognised. This present case conforms in detail to neither pattern. The pathologists have called it atypical tuberculosis and I for one would not cavil at that designation.

I express with gratitude my indebtedness to Sir James Learmonth for his kindness in allowing me to use his records and histological material, to Dr. E. K. Dawson for her opinion on that material, to Dr. Bernard Schlesinger for his courtesy in giving me particulars and records of his very interesting patient, and to Mr. T. V. Dodds of the Department of Pathology of Edinburgh University for the clinical photographs which are reproduced.

REFERENCES

ANDENAES, O. M. (1945), *Acta Tuberc. Scand.*, **19**, 211.
BJORNSTADT, R. T. (1950), *Acta Tuberc. Scand.*, **24**, 15.
CAMERON, C., and DAWSON, E. K. (1946), *Edinb. Med. J.*, **53**, 465.
CAMERON, C., and PURDIE, I. A. (1946), *Tubercle*, **27**, 195.
HOYLE, C. (1947), *Brit. J. Tuberc.*, **12**, 92.
LEMMING, R. (1940), *Acta Med. Scand.*, **103**, 400.
REISNER, D. (1944), *Amer. Rev. Tuberc.*, **49**, 289, 437.
RUBIN, E. H., and PINNER, M. (1944), *Amer. Rev. Tuberc.*, **49**, 146.
PINNER, M. (1945), "Pulmonary Tuberculosis in the Adult." Thomas, Springfield, Illinois.
SCHAUMANN, J. (1936), *Brit. J. Derm. and Syph.*, **48**, 399.
THOMASSEN, O. K. (1947), *Acta Tuberc. Scand.*, **21**, 87.
USTVEDT, H. J., and AARONSEN, A. (1949), *Acta Tuberc. Scand.*, **23**, 1.
WARFVINGE, L. E. (1945), *Acta Tuberc. Scand.*, **19**, 126.

THE PLACE OF X-RAY KYMOGRAPHY IN INTRATHORACIC DISEASE

By G. SIMON

From the Brompton Hospital, London

X-RAY kymography by the multiple slit method was first discovered and described by Stumpf in 1931. The literature was reviewed and up-to-date details of the method were described by Simon in 1939. At that time the indications for kymography were fairly well defined but its value as an aid to diagnosis was still uncertain. Now, eleven years later, further experience has shown its uses and limitations more clearly.

The technique has remained the same apart from minor improvements in the mechanism of the grid run. The kymograms reproduced in the present article have all been taken with the grid moving vertically in front of the stationary film, at a tube-film distance of 2 feet, and with an exposure of 100 Ma. and 80-85 K.V.P. The time of exposure was varied according to the individual's pulse rate, two or three heart beats being included in the 1-cm. travel of the grid (*i.e.*, in each frame).

A kymogram of a normal cardiovascular border. As Roberts pointed out, the heart movements are complicated and never parallel to the grid slits throughout the cardiac cycle, with the result that the tracings produced on the kymogram cannot be an accurate record of the actual movements of the cardiovascular border. In addition, the auricles are mere passengers in the movements, a fact which frequently makes it impossible to differentiate the ventricular from the auricular component on the tracing.

Nevertheless an easily recognisable pattern can usually be seen in a kymogram of a healthy young adult. Fig. 1 is an example. The characteristic left ventricular beats are seen in Frame 15, with their slow out-thrust movement corresponding to diastole, and rapid in-thrust movement corresponding to systole.

The timing of the movements of any other part of the cardiovascular border can be assessed in relation to the movements of the left ventricle, by comparing

the distances of the peaks of their movements from the base lines of their respective frames. It can be seen in Fig. 1, for instance, that the peak of the rapid out-thrust movement of the aorta in Frame 3 lies a shorter distance above its frame base line (*i.e.*, is later in time) than the commencement of the in-thrust movement of the left ventricle in Frame 15. The return movement of the aorta is slow, corresponding to its elastic recoil.

Looking again at the kymogram of this normal person, it can be seen that the left border is relatively inert in Frame 9. It used to be thought that this inert area (often showing small pointed movements with an outward peak occurring in the ventricular diastole) represented the left auricular appendage; but, since the advent of angiocardiography and cardiac catheterisation, it has been proved beyond doubt that this part of the left cardiac border consists of the superimposed shadows of the main pulmonary artery, the left branch of the pulmonary artery and the left pulmonary vein. Angiocardiography and cardiac catheterisation have also proved that the lower half of the right border is formed by the right auricle, although a kymogram usually shows movements corresponding in timing and shape with the left ventricle, a fact which led Stumpf erroneously to suppose that the right ventricle formed part of the right border—a striking example of how a kymogram can be misleading.

Other difficulties of interpretation arise when studying the waves in the region of the left ventricular border. The most usual form to be seen in a normal heart is illustrated in Fig. 1, but peculiarities of shape are frequently seen in normal young adults; while in elderly people, or those in whom there is some cardiac enlargement, there are often no visible movements at all over an area of 2-3 frames (Fig. 2), or there are movements so atypical in shape and timing as to suggest an area of infarction although none be present.

Myocardial and valvular disease. When Stumpf introduced the multiple slit kymogram in 1931, it looked as if a very important method of investigation had become available for the study of acquired cardiac lesions. His own and other publications (notably those of Hirsch in America) suggested that a study of the shape and timing of the curves produced by the left border of the heart in the region of the apex would give valuable data in myocardial and valvular lesions; but subsequent work showed the method to be unreliable. Comparative clinical studies soon showed that the electrocardiograph gave more reliable information than the kymogram concerning the presence and severity of myocardial lesions; while, owing to the difficulty of differentiating the auricular from the ventricular movements, the kymogram was found to be of no clinical use in acquired valvular disease.

It was hoped that a kymogram might reveal the amount of incompetence in some cases of mitral stenosis, and thus help the surgeon in the selection of cases for operation; but it has not yet proved valuable in this respect.

In aortic regurgitation, deep aortic pulsations can be seen on the kymogram, but these merely confirm what can be deducted from feeling the radial artery pulse.

Congenital heart lesions. The scope of kymography in congenital heart lesions is slight. Children under the age of 5-8 are not able to co-operate sufficiently to make a reliable tracing. In older children, when a large pulmonary artery

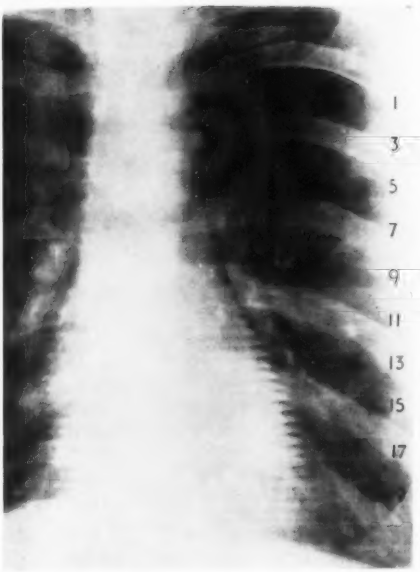

FIG. 1.—KYMOGRAM OF THE CARDIOVASCULAR BORDER IN A NORMAL YOUNG ADULT.

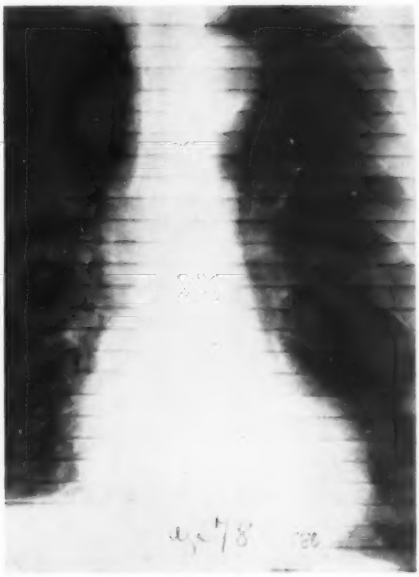

FIG. 2.—KYMOGRAM OF THE CARDIOVASCULAR BORDER IN A HEALTHY MAN OF 78.

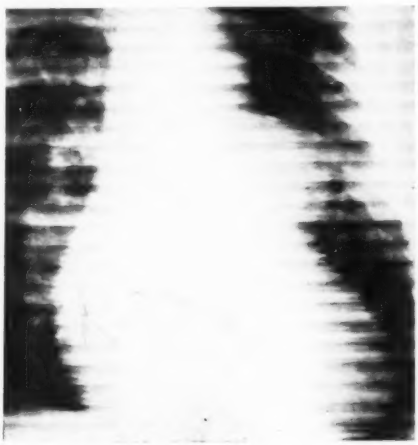

FIG. 3.—KYMOGRAM OF A PATIENT WITH A PATENT DUCTUS ARTERIOSUS AND ENLARGED PULMONARY ARTERY.

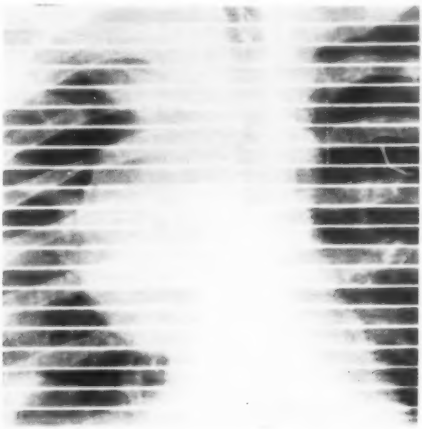

FIG. 4.—KYMOGRAM OF A PATIENT WITH COARCTATION OF THE AORTA AND SECONDARY DEPOSITS IN THE RIGHT HILUM.

To face page 94

FIG. 5.—KYMOGRAM OF A PATIENT WITH AN UNFOLDED AORTA.

FIG. 6.—KYMOGRAM OF A PATIENT WITH A SMALL PERICARDIAL EFFUSION.

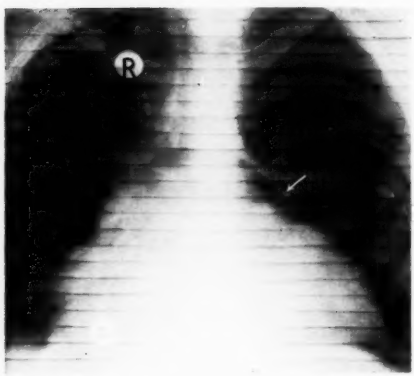

FIG. 7.—KYMOGRAM OF A PATIENT WITH A HYDROPNEUMOPERICARDIUM.

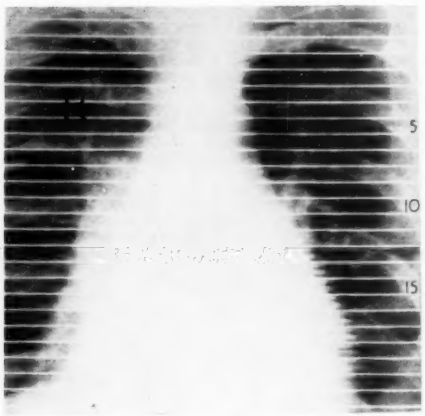

FIG. 8.—KYMOGRAM OF A PATIENT WITH CONSTRICTIVE PERICARDITIS.

To face page 95

is present, a kymogram will show that the movements of its shadow on the left border are similar in shape and timing to those of the aortic knuckle just above it (Fig. 3); but this, unfortunately, will not serve to differentiate a patent ductus (in which the typical murmur is absent) from conditions likely to be confused with it, such as an interatrial septal defect; so that cardiac catheterisation may still be indicated in such cases.

In hilar dance, as seen in interatrial septal defects, etc., a kymogram may be useful to confirm and record the fluoroscopic findings. In coarctation of the aorta, a kymogram will often show the site of the constriction, but will not show the exact size of the aorta either side of it, or the size of the main and colateral vessels; so that in this respect it is much inferior to angiocardiography.

Differentiation of bronchial neoplasm from an enlarged pulmonary artery.

By means of kymography enlargement of the pulmonary artery, due to a congenital heart lesion or other cause, can usually be differentiated (on account of its typical aortic wave form) from a bronchial neoplasm behind the left hilum or from enlarged hilar glands.

Differentiation of mediastinal tumour from aortic aneurysm or unfolded aorta.

As a rule there is no confusion of the diagnosis between an aortic aneurysm and a mediastinal tumour; but sometimes the distinction is difficult even after clinical and routine radiological investigation. In such cases kymography may be of help, and may make unnecessary the rather unpleasant experience of angiocardiography.

It must be remembered that the presence or absence of pulsation of the borders of the abnormal shadow is often not an important factor, since an aneurysm with a clot in it may show no movement; while a vascular tumour may have intrinsic pulsation, and a fluid-containing tumour (such as a cyst) transmitted pulsation. The chief value of the kymogram is to show whether normal aortic pulsations can be seen independently of the abnormal shadows, which would suggest a diagnosis of neoplasm; or whether this is not so, in which case an aortic aneurysm should be suspected.

An example of the use of kymography in this respect is illustrated in Fig. 4. A shadow had been seen in the right hilum subsequent to a right lower lobectomy for carcinoma. Since coarctation of the aorta was also present, it was considered that an aneurysmal dilatation might have occurred in this following the lobectomy. The kymogram, however, showed that the opacity did not pulsate, and that the aorta on the left border showed little alteration of movement, thus indicating that the opacity was a secondary deposit.

It is sometimes necessary to differentiate the shadow of a normal but unfolded aorta from that of a mediastinal tumour, especially if there is clinical suspicion of intrathoracic deposits. A kymogram will easily differentiate these two conditions. Fig. 5 is a kymogram of an elderly man with suspected secondary deposits. The shadow on the left side is seen to pulsate with the aortic type of movement, and no other pulsating shadow can be seen; the shadow is therefore an unfolded aorta.

These examples may sound rather far-fetched, but there is no doubt that,

when faced with shadows presenting this sort of problem a kymogram is often of help, even if only to confirm that a shadow really is a large aorta or a tumour. It is unfortunately necessary for the patient to hold his breath for at least three seconds, so that kymography is of no value in young children in the detection, for example, of tuberculous hilar glandular enlargements.

Pericardial effusion. When a pericardial effusion is known to be present, a kymogram is not necessary; but now and again the onset of this complication is not obvious either clinically or on routine X-ray examination, and in such cases kymography may be of great help. Certain technical difficulties have prevented its more extensive use for this purpose. A kymogram cannot be taken with the ordinary mobile X-ray unit in use in the ward, so that the patient, who is usually very ill, must be moved to the main X-ray department. If this is nearby, and contains an X-ray kymogram which can be used horizontally, the examination can be conducted without undue disturbance of the patient; but when the conditions are less suitable, it must be forgone.

Fig. 6 illustrates the appearances seen in a kymogram of a young adult with quite a small pericardial effusion. There is absence of movement of both heart borders. These appearances are similar if the kymogram is taken with the patient sitting upright.

If a hydropneumopericardium is present, as may be the case after aspiration of some of the fluid or after a wound, a kymogram of a sitting patient will show an immobile heart border in the lower part where the fluid lies. Above the fluid level, the air translucency will be demarcated laterally by a white line representing the thickened pericardium, which will show slight or even no movement. Medially the air space will be bounded by the heart and aortic knuckle, and these parts will show more or less normal movements (Fig. 7).

Should the lesion be a tuberculous pericarditis, a kymogram is indicated when the acute phase is over and (if possible) the fluid absorbed. This initial film is often of considerable value as a control with which to compare further kymograms taken months or years later, since diminution of the extent of the pulsations may indicate the onset and severity of any constriction and thus help the surgeon in planning treatment.

Constrictive pericarditis. The diagnosis of constrictive pericarditis may follow after months or years of observation of a patient known to have or have had a tuberculous pericardial effusion; or the condition may be detected without previous warning when the constriction is already well established. Fluoroscopy may show diminished movement of the heart borders. A kymogram will give a permanent record of the fluoroscopic appearances and may, in addition, reveal the extent of the areas affected, thus helping the surgeon in the planning of his operation. Fig. 8 is a kymogram of the heart in a case of constrictive tuberculous pericarditis. It shows that the apex of the left ventricle is moving freely, while there is much restriction of movement just above the apex and along the whole of the right border.

Pleuropericardial adhesions. Since pleuropericardial adhesions are usually difficult to demonstrate on ordinary X-ray examination, a kymogram will be indicated if they are suspected. They may be hidden by the heart shadow; but if they can be seen tangentially they will appear as a slight localised drawing out of the heart border during systole. Sometimes there is an associated

pleural thickening in the lower axillary region, which may also show some medial movement during systole. Interpretation of these appearances is difficult, since a vigorously moving heart will normally cause some movement of a considerable area of the whole thoracic wall without any adhesions being present.

Disorders of the diaphragm. The movements of the diaphragm can be recorded by kymography. This is best done with the grid lines running vertically in relation to the patient, instead of horizontally as in the illustrations recorded here. The method, however, has found no useful clinical application yet, since gross variations of the normal diaphragm movements are easily seen by fluoroscopy, and minor variations are not clinically significant.

Pulmonary cavities. It was hoped that by observing the diaphragm movements simultaneously with the inferior wall of any large pulmonary cavity, some selection of cases suitable for phrenic nerve interruption could be made; but it is now known that this gives no help and kymography is no longer used for this purpose.

Œsophageal fixity. Kymography can record the extrinsic movements of the barium-filled œsophagus as well as the intrinsic ones due to its muscular contractions. Tracings to show the former are of no great value, partly because the swallowed barium forms a somewhat inelastic mass, and partly because the movements are ventricular in phase, the auricular movements being masked by the much larger ventricular ones. Tracings to show the intrinsic movements have been of value in studying œsophageal physiology, but have not yet had much practical clinical application.

Conclusion. The early hopes attached to X-ray kymography have been only partly justified. Increasing experience has shown its severe limitations, and newer methods of diagnosis have further reduced its field of usefulness. It is sometimes valuable in the differentiation of a neoplasm from an aortic aneurysm, a dilated aorta or a pulmonary artery. Its value in certain cases of pericardial effusion and constrictive pericarditis is fully established; and it is here, rather than in valvular and myocardial lesions, that it is likely to be of help in diagnosis, prognosis, or planning of treatment.

BIBLIOGRAPHY

HIRSCH, I. S. (1934), *Brit. J. Radiol.*, **7**, 728.
McLAREN, J. W. (1948), "Modern Trends in Radiology," 175.
ROBERTS, FF. (1939), *Brit. J. Radiol.*, **12**, 638.
SIMON, G. (1939), *Proc. Royal Soc. Med.*, **32**, 1157.
STUMPF, P. (1931), "Das Röntgenographische Bewegungsbild und seine Anwendung (Flackenkymographie und Kymoskopie)," Leipzig.
Id. (1933), *Röntgenpraxis*, **5**, 721.
Id. (1927), *Fortschr. a. d. Geb. d. Röntgenstrahlen*, **36**, 111.
Id. (1934), *ibid.*, **49**, 211.
Id. (1934), *Brit. J. Radiol.*, **7**, 707.

STREPTOMYCIN IN THE TREATMENT OF PULMONARY TUBERCULOSIS

By DAVID WEITZMAN, F. E. de WEND CAYLEY and ALEC L. WINGFIELD

From the Tuberculosis Departments of St. Stephen's, Seamen's and the Western Hospitals

Streptomycin is now being extensively used in this country for the treatment of various forms of tuberculosis. Its value in the previously invariably fatal meningitis is well known, and, recently, encouraging results in genito-urinary tuberculosis have been reported. Since the M.R.C. report on its use in pulmonary disease some eighteen months ago, little further has been published on this subject in this country.

The purpose of this paper is to record the results obtained by a number of physicians treating unselected cases of pulmonary tuberculosis in general hospitals. It must be emphasised that this is in no sense a piece of controlled research, and sensitivity tests were not usually done. Cases were admitted more or less in the order of their appearance on the waiting list. Each was then assessed, purely on its own merits, as to whether or not streptomycin was necessary in treatment. The preliminary assessment of probable response to treatment was made in each case by the same person (A. L. W.) using the same general criteria.

In general, the drug was used in the type of case which, from our previous experience, could not be expected to improve with the more conventional methods of bed rest and collapse therapy—excluding, of course, markedly fibrotic or other irreversible lesions. We used it, therefore, on acute, spreading, mainly exudative and often bronchogenous types of lesions, in which it is common knowledge that collapse therapy is inadvisable and fraught with the danger of such complications as atelectasis and empyema.

Many such cases, following a course of streptomycin, became suitable for collapse therapy. This is perhaps the major contribution which streptomycin has made to the problem of the treatment of pulmonary tuberculosis; it frequently renders artificial pneumothorax and thoracoplasty safe and feasible in cases in which originally such procedure would have been unsuitable and risky. The same concept from the surgeon's viewpoint has recently been presented in an article in *Thorax* (*vide infra*).

In addition to this, the drug was used, almost in an experimental manner, on cases with pneumonic and bronchopneumonic lesions, often with involvement of other organs also, in whom the trend, according to previous experience, had been of steady deterioration to a fatal issue. In about half of these cases streptomycin did little more than temporarily arrest such a trend, but in the remainder improvement, often striking and unexpected, occurred, with complete reversal of prognosis.

The results are tabulated below. Cases treated at three hospitals (St. Stephen's, the Western and the Seamen's) are included. The letters "A," "B" and "C" under the heading of "Assessment" have the following significance:

A=expected initially to improve on streptomycin only.
B=expected to improve on streptomycin plus coincident or subsequent collapse therapy.
C=not expected to improve.

Summary of Results

Total cases included in survey		114
Improved	46 } Total improved	= 79 (69·3%)
Improved and rendered fit for collapse therapy	33 }	
No change attributable to treatment		21 (18·4%)
Worse		10 (8·8%)
Died		4 (3·5%)

The results are made up as follows:

Assessment	*Improved*	*Improved & fit for Collapse Therapy*	*ISQ*	*Worse*	*Died*	*Total*
St. Stephen's Hospital: (Males)						
A	3	4	1	–	–	8
B	5	6	1	–	–	12
C	4	2	5	1	–	12
	12	12	7	1	0	32
St. Stephen's Hospital: (Females)						
A	9	1	2	–	–	12
B	0	4	–	–	–	4
C	7	–	5	4	–	16
	16	5	7	4	0	32
Seamen's Hospital: (Males)						
A	1	–	–	–	–	1
B	2	4	2	–	–	8
C	2	–	4	1	1	8
	5	4	6	1	1	17
Western Hospital: (Males)						
A	2	–	–	–	–	2
B	2	3	–	–	–	5
C	6	–	1	–	3	10
	10	3	1	0	3	17
Western Hospital: (Females)						
A	1	–	–	–	–	1
B	–	6	–	–	–	6
C	2	3	–	2	2	9
	3	9	0	2	2	16

Sex	*Treated*	*Improved*	*Percentage*
Males	66	46	69·7 per cent.
Females	48	33	68·7 per cent.

Of original assessments, 59 were expected to improve and of these 53 did so (89·8 per cent.); 55 were not expected to improve and 26 did (47·2 per cent.). *Sputum conversion from positive to negative* (these figures refer mainly to smear examinations):

St. Stephen's Hospital	35 of 64 cases
Seamen's Hospital	4 of 17 cases
Western Hospital	12 of 33 cases
Total	51 of 114 cases=48 per cent.

Involvement of Other Organs

Twenty-seven cases had other sites of tuberculous disease as listed below:

Larynx	12
Empyema	6
Adenitis	3
Genito-urinary	2
Bone and joint	2
Peritoneum	2
Mastoid	1
Breast	1
C.N.S.	1

Three cases had more than one other organ affected.

Dosage

One gramme daily in two doses of 0·5 gm. was used. At first this was given without intermission until the course was completed; later it was given for 14-day periods with 4-day rests between. In most cases the total dose was 90 gm. Some who showed very rapid improvement received only 40-60 gm., as did others in whom the drug appeared to have no beneficial effect. Two cases received more (120 and 152 gm.). P.A.S. was also given to 17 cases; all the more recent cases have had such combined therapy in an attempt to stave off drug-fastness; many of the cases, however, were treated before it had been recognised that concurrent administration of P.A.S. would lessen the tendency to form streptomycin-resistant bacilli.

Side Effects

These have been very few and mild, necessitating cessation of treatment in one case only. They occurred in 9 cases (excluding Western), of which 3 were vestibular and 6 dermal. Of the latter, 4 showed a curious phenomenon which does not appear to have been previously described. These 4—all young males—developed purplish-red cutaneous striæ similar to those seen in Cushing's syndrome or in extreme obesity. They were not related to sites of injection or particularly related to considerable weight increase—one case who showed them had actually lost weight. They did not recur in one case who had a second course 6 months later. All four did very well.

Period of Observation

St. Stephen's—Males: Range 2½-16 months, average 7 months.
(Range 4-16 months, average 9 months, if 7 cases still under treatment excluded.)

St. Stephen's—Females: Range 3-14 months, average 6 months.
Seamen's: Range 1½-9 months, average 4 months.
(Average 5 months if 3 cases still under treatment excluded.)
Western: Range 3-25 months, average 8 months.

Illustrative Cases

1. G.D., a salesman aged 23, had been unwell for 4 months prior to admission. He was pale, wasted and looked extremely ill and toxic. His B.S.R. on admission was 54 mm./hr. Though only slightly febrile, he had a diurnal swing of over 2° F. The chest film showed disseminated bronchopneumonic lesions scattered throughout the right lung, with a few on the left side also. The prognosis was considered to be unfavourable. He was given streptomycin 1 gm. daily. After only 35 gm. his general appearance had undergone a striking alteration. He was a much better colour, his B.S.R. was then 22 mm./hr. and X-ray showed considerable clearing in all areas.

After 90 gm. his B.S.R. was 15 mm./hr., there was no sputum, and he had gained 7 lb. in weight. He was transferred to a sanatorium with every indication of continued improvement.

2. J.W., an Irish labourer aged 37, had had a hæmoptysis three weeks prior to admission. He was ill and toxic, with evidence of recent loss of weight. The X-ray showed what was virtually a caseous pneumonia, with cavitation, occupying the left upper lobe. His B.S.R. was 54 mm./hr., and his sputum purulent.

During the first few weeks in hospital the disease continued on a stormy course, with swinging pyrexia up to 104° F. and repeated hæmoptyses. A second X-ray showed atelectasis involving the left upper and middle segments. His general condition deteriorated and he was thought to be almost moribund.

After 30 gm. of streptomycin his general condition had improved considerably, his temperature was settling, and there was evidence of re-aeration of the left upper lobe. After 65 gm. there was a marked clearing of the infiltration, he was gaining weight and was afebrile. On completion of the 90 gm. course his B.S.R. was 13 mm./hr. and he had gained 16 lb. in weight; but the sputum was still positive. However, his disease was now considered sufficiently quiescent for an A.P. to be attempted; this, however, was unsuccessful. A surgical opinion was sought and it was agreed that the patient had been rendered fit for a thoracoplasty; a left phrenic crush and an artificial pneumoperitoneum were carried out as a holding measure and he has been transferred to a sanatorium for eventual surgery.

3. R.S., male, aged 33, without previous history of ill-health, presented with a spontaneous pyopneumothorax. Tubercle bacilli were recovered from the pus, and a film taken after aspiration showed a system of cavities in the right lower lobe; in one the point of rupture into the pleura could be clearly seen. As there was a mixed infection he was treated with penicillin as well as streptomycin and repeated aspiration. His illness ran a remarkably smooth and uneventful course. The fluid became sterile and the pleural space was gradually obliterated. He was then transferred in good condition to a sanatorium to undergo thoracoplasty for cavity closure.

4. M.W., a Burmese girl aged 22, was admitted in a moribund state with extensive bilateral disease and laryngeal involvement. This case was originally considered so hopeless that only a short (2 weeks) course of streptomycin was given, simply for the purpose of relieving pain due to her laryngitis; however,

since improvement became manifest, treatment was continued to a total of 152 gm. She has gained 3½ stone in weight and is now considered suitable and fit for a left pneumonectomy.

5. A.B., a seaman aged 43, had a short history of cough with sputum, occasionally blood-stained, loss of weight, night sweats and shortness of breath. He was ill, toxic and febrile. X-ray of the chest showed infiltration and cavitation in all zones of the right lung and infiltration in the left mid-zone. His B.S.R. was 53 mm./hr., and the sputum was positive for tubercle bacilli.

Streptomycin was administered in doses of 0·5 gm. b.d. to a total of 42 gm., given in conjunction with P.A.S. 18 gm. daily. At the end of the course his condition was much improved and the sputum was negative. A right phrenic crush and an artificial pneumoperitoneum were carried out and 2 months later, when transferred to a sanatorium, his radiological picture showed some improvement, his sputum was still negative, and his general condition was very much improved.

6. Two patients, in whom streptomycin caused complete clearance of the pulmonary lesion but failed to prevent hæmatogenous dissemination, may be of interest. One, a boy of 18, was admitted with miliary deposits in all lung fields: after treatment, there was radiological evidence of complete resolution, his health was restored and he returned to work. Some six months later, however, he reported again with the disease now involving the right sterno-clavicular joint and the left fifth metacarpal. The lungs remained clear.

The other was that of a man who had had a chronic fibrotic lesion for 20 years and suddenly developed a caseous pneumonia. In his case, also, radiology revealed complete resolution of the recent pulmonary lesion, but genito-urinary and meningeal lesions developed while treatment was in progress.

Other Reports

Many surveys of treatment have appeared in Continental, American and Canadian journals, but the subject has not been discussed to anything like the same extent in the British medical press. This, one imagines, is at least partly due to the fact that streptomycin has become available in quantity in Britain only during the past year or so. The M.R.C. investigation (1948) summarised in the *British Medical Journal* described the results in 55 cases of acute progressive bilateral pulmonary tuberculosis unsuitable for collapse therapy. These were treated with 2 gm. daily and had been under observation for one year. Thirty-one were considered to have improved, 4 were ISQ, and 20 worse, 12 having died. Of 52 comparable controls, only 16 had improved and 31 were worse, with 24 deaths. Karamchandani (1949) and his colleagues describe improvement in 24 out of 47 cases and suggest that the drug be tried in all types of lesions other than those considered irreversible. Keers (1948) gives an account of 10 cases; 6 of these had exudative disease and 4 were improved. The remaining four underwent thoracoplasty with streptomycin "cover" and did well. Sreenivasan (1948) has described one "apparently hopeless" case of bilateral bronchopneumonic phthisis with laryngeal involvement in which recovery with almost complete radiological clearing took place. Birath and co-workers (1950) compare the effects of streptomycin and P.A.S. in rendering "borderline" cases suitable for thoracic surgery. They consider streptomycin superior in making such cases fit to undegro surgery with insignificant risk of post-operative complications. Lorber (1950), on the other

hand, could not demonstrate any effect from the drug on the primary lung complex in 20 children with miliary tuberculosis and meningitis; but it seems reasonable to assume that in such cases resistance to tubercle must be very low.

The American reports cover a much larger field. The U.S. Veterans Administration carried out a survey, from June 1946 to October 1948, of 943 pulmonary cases in the majority of which streptomycin reversed the trend of progression in predominantly exudative disease, but relapses were frequent. Collapse therapy was made feasible in 20 per cent. Martin (1949) found that in 254 treated cases there was a higher rate of sputum conversion and a lower death rate as compared with 288 untreated controls. McLeod *et al.* (1949) considered that results were poor in 332 cases, with frequent relapses and failure of sputum conversion and cavity closure, although the drug is not usually regarded as capable of bringing about the latter unaided, and the authors do, in fact, recommend coincident collapse therapy. The Streptomycin Committee in 1947 reviewed 223 patients and found that 85 per cent. showed improvement as compared to 30 per cent. of controls. As regards Canadian experience, an example is that of Lee, who found a good response to treatment in 176 cases, mostly with exudative disease. The improvement in many cases continued after stopping treatment.

Of the continental reports, some of the more extensive are those of Bernard *et al.* (1948), 200 cases; Westergren (1949), 200 cases; and Constantini (1949), 182 cases. There are other American and Continental reports too numerous to mention; they are practically all favourable.

Conclusions

As a result of their observations the authors consider that streptomycin is of value in those types of pulmonary tuberculosis with other than minimal lesions or with chronic fibrotic and irreversible changes, which are unlikely to improve on bed rest alone or are unsuitable for immediate collapse therapy. It is most particularly indicated in acute exudative cases with low resistance, and in endobronchial tuberculosis with or without atelectasis. In such cases the results may be gratifying beyond expectation.

The drug is also a valuable adjunct to collapse therapy—which must, together with bed rest, remain the sheet anchor of treatment—and frequently renders such therapy feasible in cases where previously it might never have become so without a high attendant risk of disaster.

Because of the problem of drug-fastness doubts may arise as to the advisability of using it in cases where surgery is later contemplated, since it may again be required should post-operative spread occur. Such cases have been carefully assessed and the drug withheld if possible. The recent demonstration of the value of P.A.S. in retarding the onset of streptomycin resistance has made it possible to use the combined treatment at an earlier stage in the therapeutic programme. Many of the cases in this survey would not have become suitable for surgery had preliminary streptomycin treatment not been given. As is already well established, streptomycin has been able to control a local lesion without checking hæmatogenous dissemination.

The results obtained in this series are similar in principle to those described in other reports on much larger numbers of cases in American and Continental journals.

Summary

One hundred and fourteen cases of pulmonary tuberculosis treated with streptomycin are reviewed. Improvement occurred in 79 (69·3 per cent.). Streptomycin was found to be of particular value in acute exudative and endobronchial tuberculosis. A short survey of the literature is included.

Our best thanks are due to Dr. King-Brown, Senior Medical Registrar, Seamen's Hospital, and to Dr. S. Parikh, Medical Registrar, Western Hospital, for their valuable assistance.

REFERENCES

Bernard, E., and Lotte, A. (1948): *Rev. de la Tuberc.*, **12,** 165.
Birath, G., Bruce, T., Crafoord, C., and Uggla, L. G. (1950): *Thorax*, **5,** 59.
Karamchandani, P. V., Ramachandran, R., Devadas, N. P., Kidiyoor, S. R., and Sanjeevarao, P. (1949): *Lancet*, **2,** 886
Keers, R. V. (1948): *Lancet*, **2,** 449.
Lee, J. H. (1949): *Canadian Med. Ass. J.*, **60,** 241.
Lorber, J. (1950): *Lancet*, **1,** 389.
Martin, G. E. (1949): *Pennsylvania Med. J.*, **52,** 708.
McLeod Riggins, H., and Hinshaw, H. C. (1949): *Amer. Rev. Tuberc.*, **59,** 140.
M.R.C. Report (1948): *Brit. Med. J.*, **2,** 770.
Sreenivasan, B. R. (1948): *Tubercle*, **29,** 128.
Streptomycin Committee Report (1947): *Amer. Rev. Tuberc.*, **56/6,** 485.
U.S. Veterans Administration (1948): *J. Amer. Med. Ass.*, **138,** 584.
Westergren, A. (1949): *Le Poumon* (Paris), **5/3,** 187.

ADVICE TO PNEUMOCONIOSIS PATIENTS

By A. MEIKLEJOHN

Of the University of Glasgow, and sometime member of Silicosis Medical Board

The patient confronts the doctor with three problems, diagnosis, treatment and prognosis, the greatest of which is diagnosis. Never before in the history of medicine have doctors had available to them so many mechanical aids and tests to assist in achieving accuracy, but, unfortunately, the patient is all too often forgotten and the focus is on the disease, while more and more the concept of what constitutes disease becomes, except in the scientific sense, less realistic. According to a recent Government committee (*Report on Industrial Diseases*, 1948), "Disease is any departure from health capable of identification by its signs and symptoms." One result of this approach is the constant search for the specific or pathognomonic sign, which in the field of dust diseases of the lungs is exemplified by the increasing reliance placed on the radiographic changes in the lungs. While it is true that the diagnosis of pneumoconiosis cannot be established with certainty unless supported by certain radiographic changes in the lungs, and while it is generally accepted that the radiographic appearances provide the best *single* piece of evidence as to the presence, extent and character of the disease, X-ray examination of the lungs remains solely

an aid, even when the test is applied to workers engaged in occupations or processes in which a specific dust hazard is recognised. The old-fashioned clinical examination is not outmoded—on the contrary, it is still the fundamental principle. Admittedly, it may fail to reveal either pulmonary symptoms or signs in the presence even of indisputable radiographic changes, but diagnosis is more than definition of a pathological lesion in the lungs; the disease must be related to the whole man, mental and physical. What is equally important is that the significance of the condition to the individual and its implications for him and his family should be critically assessed. Moreover, these judgments must be made in relation to life in current circumstances, not to what might be in an ideal state.

Briefly, the submission is that the diagnosis of pneumoconiosis involves, firstly, clinical investigation; secondly, the occupational history embracing the whole working life; and, thirdly, radiographic examination of the lungs. All three must be considered together, but the most significant is the clinical investigation. Otherwise the doctor ceases to be a physician and becomes a technologist.

Mass radiography has now extended beyond tuberculosis surveys, and in pneumoconiosis-producing industries finds increasing use in the early detection of the disease. In factory surveys without previous clinical examination the workman is advised that he is suffering from pneumoconiosis. Such phrases in the X-ray report as " simple pneumoconiosis," " in an early stage," " the appearances are suggestive " may be significant to his doctor, but for the workman, his mates and his family they are dread words. Extensive publicity in the Press and on the wireless have, in recent years, not only awakened his consciousness but simultaneously quickened his fear, and the same awareness and fear are shared by his family. In his predicament he naturally turns to his family doctor, whose responsibility is aggravated by the mental overlay which has already attached to the " X-ray diagnosis." Recently, I was involved in the aftermath of such an X-ray survey among a group of steel-foundry workers. All were highly skilled men between the ages of 30 and 65 years and earning (including bonuses) high wages. It was entirely outside my assignment to make any medical examination, to interpret the X-ray films or to advise any individual workman. The best I could do in the circumstances was to prepare, in non-technical language, a brief memorandum for general guidance. As judged by immediate results the procedure proved highly acceptable and so may be of interest to readers, who may be encouraged to improve or adapt it.

Some Practical Information about Pneumoconiosis

When a workman suffers from a disease he is not greatly interested in its technical name, but he is very concerned to know how it will affect his health and ability to earn his living. The report which by your consent has been sent to your doctor may suggest that, as a result of your recent X-ray examination, there is reason to suspect you have contracted a degree of pneumoconiosis. By giving you some simple but expert information on the disease in general it is hoped to avoid undue worry to you and your family. In due

course you will be able to consult your own doctor, who in turn may refer you to a specialist.

In a wide variety of occupations it is recognised that the workmen in the course of their employment inhale fine particles of silica dust into the lungs. At first there is no apparent ill-effect, but after a number of years the irritation of this dust within the lungs causes minute scars (fibrosis) to form in these organs. This is dust disease of the lungs, which in medical language is known as pneumoconiosis. There are several varieties of pneumoconiosis, the best known being silicosis. Certain workmen employed in steel-foundries, particularly those engaged in removing adherent sand from castings by means of hand or machine tools, are exposed to this risk. This fact is probably known to you; at any rate it is well known to your Trade Union officials. It is known to the Government, and in certain occupations and processes pneumoconiosis is recognised as an industrial disease for which, under the National Insurance (Industrial Injuries) Act, 1946, provision is made for payment of disablement benefits (compensation) which are substantially higher than those paid for ordinary sickness. Details of these benefits and information relating to them are set out in the official pamphlet supplied to you.

How does the disease affect a workman?

For a number of years there are no noticeable ill-effects. Usually the earliest sign is breathlessness on exertion, and this shortness of breath and tightness of the chest may get gradually worse if the disease progresses. Whenever such symptoms occur it does not necessarily mean you have contracted pneumoconiosis. Breathlessness may result from many causes, excessive cigarette smoking, as many of you know, being a very common cause; another cause is " getting old."

How is the disease diagnosed?

The diagnosis can be made only after full medical investigation, which must include X-ray examination of the lungs. This is the only certain means of recognising the disease, especially in the early stages, and, indeed, the disease cannot be considered to be present unless proved by the appearance of abnormal shadows on the X-ray plate.

Can the disease be cured by treatment?

No, the scars such as occur after a deep cut on your hand are permanent, but in future years, due to more prolonged action of the dust or inflammation, they may become bigger and tougher. Progression, however, is usually slow.

Are there any serious complications?

Yes; in *some* cases tuberculosis of the lungs may result.

What should a workman do about his job when he discovers that he has contracted the disease?

The disease is due to the dust, so that if he continues in his job he is likely to inhale more of the dangerous fine particles, which in time may aggravate his condition. If he gives up work in a dusty occupation he minimises this

possibility, but tuberculosis may still occur as a complication. Whether a workman should give up his skilled occupation or continue in it is a matter for expert medical advice in each individual case. In the first place, a workman rightly feels that the best person to give him advice is his own private doctor, whom he has selected for himself. If the doctor deems it necessary he can refer the workman to a specialist in chest diseases, or through the local Insurance Officer to the Ministry of National Insurance experts of the Pneumoconiosis Medical Panel.

A craftsman does not readily give up his skilled job. Firstly, he may feel too old to learn another trade and, secondly, whatever employment he might get outside his own job is likely to mean a sacrifice of wages greater than he can afford. What, then, is he to do? He knows his own circumstances best and he alone can decide which is the lesser risk for him, either to risk getting more dust or to suffer the risk of a lowered standard of living.

As already mentioned, the progress of the disease, unless complicated by tuberculosis, is slow, so there is no need to rush into a hasty decision to give up the job, and, moreover, there is no need to stand off from work to obtain an examination by the Pneumoconiosis Medical Panel. If a claim is made for such an examination it will be arranged by appointment. As a further safeguard it is intended that an opportunity for regular X-ray examination at the works should be available each year, thereby assuring every workman that his condition will be kept under periodical review and report.

In these circumstances men over the age of 45 years will probably find that it is best for them to carry on. Younger men will also be well advised to carry on until they can find suitable alternative employment. At the same time it should be borne in mind that any man who feels his condition is getting worse can always consult his own doctor, who, if necessary, can arrange for further examination by a local chest specialist.

In the case of men who obtain a percentage disablement award under the National Insurance (Industrial Injuries) Act, 1946, the Pneumoconiosis Medical Panel keep them under regular review at intervals of one year.

It is the intention of the promoters of this scheme to repeat the X-ray examinations at annual intervals and in certain individuals six-monthly. This is bound later to create a problem which so far has not been met. It relates to those workmen whose original report disclosed " no significant abnormality." As it happens, several of these are borderline cases, and on the next occasion without any alteration in the radiographic appearances may be reported as very early pneumoconiosis. This may very easily create a false impression that the disease is rapid in onset, in so far as development has occurred after an interval of twelve months. On the other hand, certain borderline cases diagnosed positively on one occasion may subsequently be reported as " no significant abnormality."

Radiographic examination of the chest is still at best only an aid in the diagnosis of pulmonary disease, and mass radiography is only a rapid method of " screening " large groups. The art of medicine is to interpret the science of medicine for the benefit of the individual, the family and the community, and there are no short cuts.

As a practical means of regular supervision the time has come to consider notification of all certified (that is, by Pneumoconiosis Medical Panels) cases of pneumoconiosis in like manner to tuberculosis of the lungs. Thus these patients would be assured of continuous expert observation. There are practical difficulties, such as associating in waiting-rooms with tuberculous patients and the large number of cases in areas like South Wales, but some effective scheme could undoubtedly be devised. The great need is to alter the focus in these cases from disease and compensation to residual health and work. The pneumoconiosis patient " hath need of a physician."

REFERENCE

Report of the Departmental Committee on Industrial Diseases, 1948. H.M.S.O. Cmd. 7557.

TUBERCULOSIS STAMPS, SEALS AND EMBLEMS

By W. J. BISHOP

From the Wellcome Historical Medical Library, London

The collection of postage stamps by " subject " rather than by country of origin is now a well-recognised department of philately. Practically all stamp catalogues are arranged on a topographical basis, the issues of each country being exhaustively listed in chronological order. So long as the collector confines himself to stamps of a particular country or region he finds that the field is completely mapped out for him. In collecting stamps illustrative of a subject, on the other hand, there is no such guidance and the collector has to range over the issues of the world in order to find those relevant to his purpose. There are stamps illustrative of almost every activity under the sun: subject collecting therefore provides infinite opportunity for individual preference and for research. Another important point is that the collector by countries can hardly hope to acquire a complete set of early issues owing to their rarity and cost. The subject collector is not handicapped in this way; he has much greater scope and can usually make his collection relatively complete.

The number of postage stamps of medical interest is very large. To begin with there are probably between two and three hundred stamps bearing portraits of qualified medical men, of workers in ancillary fields, such as Pasteur and Roentgen, and of " truants " from medicine, such as Chekhov, Clemenceau, Schiller and Sun Yat-Sen. There are in addition a vast number of stamps depicting medical scenes, hospitals, research institutions, medical and surgical instruments, medical mythology and symbolism, articles of materia medica, etc. It would be quite easy to illustrate a lecture on the outlines of medical history entirely by postage stamps, but this could not yet be done in the case of a restricted subject such as tuberculosis. There are still many gaps, especially in portrait stamps of the great pioneers in phthisiology. Nevertheless, it is rather surprising to find that there are so many stamps of interest in relation to tuberculosis and diseases of the chest.

The place of honour must be given to the portrait stamp of Robert Koch (1843-1910), whose discovery of the tubercle bacillus was announced at a meeting of the Berlin Physiological Society on March 24, 1882. Koch's researches provided the foundation upon which all work on the prevention and treatment of tuberculosis rests. Appropriately enough, the discoverer of the tubercle bacillus is one of the few medical men to be commemorated by the postage stamps of two States; his portrait appears on a Danzig stamp of 1939 and on a German stamp of 1944. Albert-Léon Charles Calmette (1863-1933), the famous bacteriologist, was a native of Nice who spent some years in the French naval and colonial services before holding professorial chairs in Lille and Paris. He carried out valuable work on plague and snake venom, but his most important contributions to medicine were in the field of tuberculosis. In 1901 he founded the Émile-Roux model dispensary at Lille, the first of its kind in France. In 1907 Calmette and Wolf-Eisner, working independently, introduced the conjunctival reaction test for tuberculosis. Two years later Calmette wrote on the digestive tract as one of the chief routes of infection in the disease. In 1924 he began vaccinating children with B.C.G.—living avirulent bovine tubercle bacilli (Bacillus Calmette-Guerin). There are two Calmette stamps: the first was issued by the French Comité National de Défense contre la Tuberculose in 1934; the second is an official French stamp issued on the occasion of the First International Congress on B.C.G. in 1948. Another unofficial stamp commemorates Niels Ryberg Finsen (1860-1904), the pioneer in actinotherapy. For his researches on the therapeutic value of light, particularly in the treatment of lupus, Finsen was awarded the Nobel Prize for medicine in 1903. The Finsen stamp issued by Denmark in 1905 is non-official, but it is rare and is much sought after. Of front-rank importance for our present purpose is the portrait stamp of Wilhelm Konrad Roentgen (1845-1923), whose discovery of X-rays made early and accurate diagnosis possible in tuberculosis. Roentgen's paper, " On a new kind of ray," read before the Wurzburg Medical Society on December 28, 1895, is one of the most important landmarks in medical literature.

Of special interest to the chest physician is the stamp bearing a portrait of Leopold Auenbrugger (1722-1809), discoverer of the art of percussion. Auenbrugger was the son of an innkeeper, and it has been suggested that he must often have seen his father tap on the kegs with his fingers to ascertain the level of the contents. As a music lover and amateur composer Auenbrugger was well able to interpret the notes derived by striking the chest. His *Inventum Novum*, published in 1761, is now one of the rarest of the great medical classics. The Auenbrugger stamp is one of a series of nine portraits of worthies of the Vienna Medical School. In the same series are excellent portraits of Josef Skoda (1805-81), a lifelong investigator, who described Skodaic resonance and systematised the whole subject of physical signs in his *Abhandlung über Perkussion und Auskultation* (1839); of Gerard van Swieten (1800-72), one of the founders of the Old Vienna School, who made observations on the development of lung ulcers, advocated country air, and described the crepitant râle, which he likened to " rubbing a lock of hair between the fingers "; of Karl Rokitansky (1804-78), the great Viennese pathologist, who made important contributions to the knowledge of non-pulmonary tuberculosis. The genius

of Rudolf Virchow (1821-1902) illuminated many aspects of the tuberculosis problem. His portrait appears on a stamp issued in the Russian Zone of Germany in 1948.

Many of the greatest names in the history of tuberculosis are not represented in the philatelic gallery: there are no portrait stamps of Bayle, Laennec, Louis, Corvisart, Villemin or Forlanini; and of course no British phthisiologists are commemorated on postage stamps. There are many portraits of men whose work in other directions overshadows their contributions to our knowledge of tuberculosis, but who, nevertheless, are of interest to the phthisiologist. To Hippocrates (460-377 B.C.) we owe the first detailed description of the semeiology of phthisis. A statue of the Father of Medicine appears on a Greek stamp issued in 1946 to commemorate the liberation of the Dodecanese Islands. A recent German stamp provides a portrait of Aureolus Theophrastus Bombastus von Hohenheim (1493-1541), better known as Paracelsus. His treatise on miners' diseases, *Von der Bergsucht* (1567), the result of his observations in the Fugger mines in the Tyrol, contains descriptions of miner's phthisis and the effects of choke-damp.

François de le Böe, or Franciscus Sylvius (1614-72), Professor of Medicine at Leyden, is remembered by the aqueduct and fissure which bear his name. He was the first to employ the term " tubercle." He wrote that tubercles were often seen in the lungs in cases of consumption and they would sometimes soften, suppurate and form cavities. There is a fine portrait of Sylvius on a Netherlands stamp of 1937. Hermann Boerhaave (1668-1738), Professor of Medicine and of Botany at Leyden, was the foremost physician of his day and one of the greatest clinicians of all time. He observed that night sweats might arise from slight causes, apart from a hectic fever, and believed that tubercles are the result of anything which brings abnormal blood into the lungs. Boerhaave has been twice commemorated on postage stamps of the Netherlands, in 1925 and 1938. Emil von Behring (1854-1917), whose portrait adorns a German stamp of 1940, is best known as the discoverer of diphtheria antitoxin. He believed that much pulmonary tuberculosis was due to the ingestion of bovine tubercle bacillus and developed the idea that most adult tuberculosis is the result of previous childhood infection.

The portrait of Alexandre Jean Émile Yersin (1863-1943) appears on an Indo-Chinese stamp of 1943. Yersin was a Swiss bacteriologist who graduated in Paris, worked at the Pasteur Institute, and entered the French Colonial Service. He was a pupil of von Behring and, like his master, is particularly noted for his work on the exotoxin of diphtheria as well as for his researches on immunising sera and on plague. In 1888 he first described a " tuberculose septicémique " which he had noted in rabbits inoculated intravenously with large doses of avian tubercule bacillus.

Among other occupants of the philatelic portrait gallery of interest to the tuberculosis physician are Antony van Leeuwenhoek (1632-1723), the great microscopist (Netherlands, 1937); the towering figure of Louis Pasteur, whose portrait appears on so many French stamps; and his pupil Elie Metchnikoff (1845-1916), who is commemorated by a Russian portrait stamp of 1945. It is not generally known that A. P. Chekhov (1860-1904), the great Russian playwright and writer of short stories, was a physician. He qualified in the

PLATE XV

No. 1. Portrait of Leopold Auenbrugger, 1722-1809. (Austria)

No. 2. Tuberculosis Stamp issued in memory of Queen Astrid. (Belgium, 1935)

No. 3. Portrait of Josef Skoda, 1805-81. (Austria)

No. 4. Franciscus Sylvius (François de le Boë), 1614-72. (Netherlands, 1937)

No. 5. Hulpe Waterloo Sanatorium. (Belgium, 1932)

No. 6. Unofficial stamp depicting Niels Ryberg Finsen, 1860-1904. (Denmark, 1905)

No. 7. One of a series of Child Welfare stamps showing a physician examining a child with the stethoscope. (Germany)

No. 8. Tuberculosis stamp showing the Double Barred Cross in a crescentic form. (Spanish Morocco)

No. 9. Red Cross Stamp showing a doctor examining an X-ray film of the chest. (Hungary)

No. 10. Portrait of Robert Koch, 1843-1910. (Danzig, 1939)

No. 11. Stamp issued on the occasion of the first International Congress on B.C.G. showing portrait of A.-L. C. Calmette, 1863-1933. (France, 1948)

No. 12. Portrait of Wilhelm Konrad Roentgen, 1845-1923. (Danzig, 1939)

To face page 110

Medical Faculty of the University of Moscow and rendered valuable service in the great cholera epidemic of 1892. He made no contribution to medical knowledge, but holds high rank among the many medical men who have distinguished themselves in literature. Chekhov suffered long from pulmonary tuberculosis and is therefore of particular interest to those who seek to trace a connection between tuberculosis and genius.

Before leaving portrait stamps it should be noted that Apollo, the Sun God, appears on stamps of Greece (1906 and 1935) and France (1946). He has a double claim on our attention as the Sun God and as the father of Æsculapius, the god of healing. The beautiful French stamp of 1946 depicts Apollo driving his sun chariot across the sky.

Among non-portrait stamps the most interesting from the point of view of tuberculosis are the German Child Welfare issues, one of which shows a physician examining a child with the stethoscope, and the Hungarian Red Cross stamp which depicts the doctor in the act of examining an X-ray film of the chest. A Belgian stamp of 1932 has an excellent picture of the Hulpe Waterloo Sanatorium, and a Bulgarian stamp of 1942 shows a sanatorium with a sun-bathing terrace. In 1939 the U.S.S.R. issued several stamps advertising the Caucasian health resorts and depicting sanatoria, convalescent homes, and rest houses. The cod, source of the oil that was formerly much used in the treatment of consumption, is shown on several stamps.

Red Cross stamps, the first of which was issued by Portugal in 1889, have enormously increased the range of the medical collector. These stamps show a great variety of scenes—battlefields, wounded soldiers, nurses, hospital ships and trains, etc. They can all be easily identified by the Red Cross and the fact that they invariably bear a surcharge. Of even greater interest for our present purpose are the parallel series of stamps issued in connection with the campaign against tuberculosis. These are identified by the double-barred (Lorraine) cross, the emblem of the International Union against Tuberculosis. Many of these stamps show medical or emblematic scenes; they also provide some of the most interesting of the medical portraits. In other issues the professional interest may be slight and there may be nothing medical about the stamp except the tuberculosis cross in the corner. The series of mourning stamps issued by Belgium from 1935 onwards in memory of Queen Astrid are much sought after. All proceeds from the sale of these stamps were devoted to the anti-tuberculosis campaign.

The use of the double-barred cross as an international emblem dates from 1902, in which year it was adopted by the newly founded Central International Bureau for the Prevention of Tuberculosis which met in Berlin. The Bureau went out of existence during the first world war, but its place was taken by the International Union against Tuberculosis established at Paris in 1920, with its headquarters at Geneva. It is said that some of the delegates attending the Berlin conference had been discussing the desirability of an international emblem for years, but the definite proposal to adopt the Lorraine cross was made by Dr. G. Sersiron of Paris. It is a striking commentary on the happy character of international relations at that period that the proposal was adopted without hesitation and with practically no opposition.

The Lorraine cross, to which the tuberculosis emblem is closely related,

has been used by various movements, religious, political and fraternal, for centuries. It dates back to the Patriarchal or Jerusalem Cross carried by the Patriarchs of Jerusalem and Constantinople, and has a very interesting history. The double-barred cross was brought back to western Europe by the Crusaders, who saw it upon the Greek churches of Asia Minor and Turkey. Godfrey, Duke of Lorraine, who was a leader of the first Crusade, became familiar with the cross in the Holy Land and adopted it as his standard when he was elected ruler of Jerusalem in 1099. On his return to France the double-barred cross became the emblem of the house of Lorraine. It has remained in France as the Lorraine cross to this day, but is distinguished from the Patriarchal cross by having the lower bar nearer the base. When the tuberculosis movement adopted the cross in 1902 no effort was made to standardise its form or its proportions.

In 1906 the National Tuberculosis Association of America, at its second annual meeting in Washington, D.C., adopted the double-barred cross as its official emblem. In 1912 a definite attempt was made by the American Association to standardise the form of the cross and a committee was appointed to this end. The Committee recommended that the emblem should take the form of a double-barred cross with equal cross arms, the upper standard being shorter, and the lower standard longer than the cross arms, and the ends of both arms and standards being pointed instead of square. All the angles in the points were to be of 45 degrees. But although standardisation was achieved in America this was not so in Europe. All tuberculosis appeal stamps bear the double-barred cross adopted by the International Union, but show slight differences in shape and proportions. In tuberculosis stamps issued by Moslem countries the arms of the cross are given a crescentic form.

A further impetus to the use of the tuberculosis emblem was given by the Christmas Seal movement which originated in Denmark in 1904. The idea of selling special seals at Christmas which should be affixed to letters in addition to the official postage stamps originated with Dr. Einer Holboll (1865-1927), a physician of Copenhagen. In 1907 Miss Emily P. Bissell, Secretary of the Delaware Chapter of the American Red Cross, was inspired by reading an account of the Danish experiment to inaugurate the sale of Christmas seals in America. For the first three years the scheme was operated on behalf of the funds of the American Red Cross, but in 1910 this organisation entered into an agreement with the National Tuberculosis Association whereby the two bodies shared in the proceeds of the sale. This partnership lasted until 1919, after which all Christmas seals have been sold by and on behalf of the National Tuberculosis Association. Christmas seals sold between 1907 and 1918 bore the Red Cross emblem; the 1919 seals bore the Red Cross and the double-barred cross; since 1920 all Christmas seals have carried the double-barred cross, the official emblem of the National Tuberculosis Association, alone. Up to the present time more than forty-five countries sell or have sold Christmas seals on behalf of the anti-tuberculosis work; sales in the United States alone yield about four and a half million dollars annually. Christmas seals are not postage stamps, but they provide a perfectly legitimate field of interest for the medical philatelist.

PROPOSALS FOR A MOBILE MINOR CHEST SURGERY UNIT SERVICE

PRELIMINARY COMMUNICATION

By D. J. LAWLESS

From the Chest Service of the North East Metropolitan Regional Hospital Board

Many hospitals not primarily intended for the treatment of respiratory tuberculosis are now undertaking this work.

In one Regional Board area alone there are some twenty-one such institutions contributing approximately 840 beds for tuberculous patients. Unfortunately, none of them can at present undertake even the less major surgical procedures usually necessary in connection with artificial pneumothorax therapy. This position is no doubt multiplied in the other regions throughout the country.

Operations such as adhesion section, phrenic interruption and bronchoscopy require transfer of the patients concerned to one or other of the regional hospitals or sanatoria undertaking chest surgery. This has the inevitable effect of delaying admission to the chest surgery centres of cases for major surgery and is no doubt one reason for the long waiting lists for thoracoplasty, etc. Also this transferring of patients, besides being an added expense on the Health Service, is a factor in delaying the turnover of available tuberculosis beds.

To provide chest operation facilities in all the institutions now undertaking the treatment of tuberculosis would be a formidable and expensive undertaking. Moreover, in many institutions the numbers of beds allocated for tuberculosis are too small to warrant such provision.

The question arises as to whether some other solution can be found to deal with the problem of surgery arising out of artificial pneumothorax therapy in these institutions and with the increasing number of patients being referred for bronchoscopy. I feel that the establishment of Mobile Minor Chest Surgery Units, which could visit the various institutions on an as required or rotational system might well be an answer, at any rate as a short-term policy.

I do not wish to go into the question of the administrative arrangements which would be necessary for the operation of such units or to discuss the manner in which they would be allocated for the use of thoracic surgeons.

I think the first question to be considered is whether a Mobile Minor Chest Surgery Unit is a technically practicable proposition. To be so, it must reproduce very nearly the operating conditions to which thoracic surgeons are accustomed in their hospitals, and having regard to the various conditions under which it would have to operate, should be completely self-contained in respect of electric power supply, radiography, water supply, sterilisation facilities, etc. A tentative design, taking account of the various technical problems involved, has been worked out with the valuable assistance of the Ministry of Works Engineering Department, and a scale model is at present under construction. It is hoped, when this is available, to be able to secure official interest in the proposal and to report further on developments at a future date.

STREPTOMYCIN IN THE TREATMENT OF TUBERCULOUS MENINGITIS

[We publish below a summarised version of a report—Med. 1/C.J.D. S/1950/4.—sent to us by Dr. J. Balfour Kirk of the Ministry of Health]:

Introductory

Twenty-five hospitals and medical schools in England, Wales and Northern Ireland conducted, under the auspices of the Ministry of Health, an inquiry into the efficacy of streptomycin treatment of tuberculous meningitis. Four hundred and fifty patients suffering from meningitis with or without generalised miliary tuberculosis were under observation for periods of 10-22 months, and the following *broad* conclusions were drawn from an analysis of 369 of these cases in whom the disease was bacteriologically proven.

General Results

Early treatment with streptomycin seems to give complete recovery in 40 per cent. of cases, and whereas before the introduction of this drug tuberculous meningitis was invariably fatal, in this series mortality was reduced to 71·4 per cent. and, in early cases, 59·5 per cent. In all 104 of the 369 patients survived, 89 per cent. being fit and well and 31 per cent. having normal cerebro-spinal fluid.

Of the survivors at the end of one further year giving observation periods varying from 22-33 months all remained alive, 88 being fit and 50 having normal cerebro-spinal fluid. Of " mentally retarded," 2 had genito-urinary tuberculosis and the remaining 8 had not fully recovered a year previously. Of these 3 had bone or joint tuberculosis, 1 optic atrophy, 2 were paralysed and incontinent and 2 emotionally unstable, 1 being also deaf.

At the end of 22 months the survival rate was 27 per cent. for meningitis alone and 17 per cent. when it was complicated by miliary tuberculosis. The higher survival rate for cases detected at an early stage emphasises the importance of prompt diagnosis and treatment.

Methods of Treatment

Intramuscular treatment alone was seldom effective, particularly with miliary tuberculosis and meningitis, but should be supplemented with intensive intrathecal courses described in detail in the memorandum.

The best results were obtained in patients with " early " meningitis. Early diagnosis and prompt treatment are, therefore, of first importance.

Assessment of Results

Owing to differing conceptions of a " normal " cerebro-spinal fluid a severe standard of " normality " was adopted by all the hospitals in this investigation—namely, per ml. of cerebro-spinal fluid: cells not more than 4, protein not more than 40 mgm., sugar not less than 45 mgm.

In the series there was no case of relapse where the cerebro-spinal fluid had reached that standard and the patient was clinically well, but further investigation is needed into possible relapse after longer periods, into distinguishing relapse from reinfection and the possible occurrence of tuberculous lesions elsewhere in the body.

Detailed Psychometric Assessment

Psychiatric investigation of recovered patients is recommended, particularly where it is possible to compare their mental condition before the onset of illness. Vestibular function and deafness should also be investigated.

Laboratory Findings

Bacteriological proof is of the first importance in assessing results. In one case the cerebro-spinal fluid was negative until the sixty-second examination —*i.e.*, after about 10 months of streptomycin treatment. Samples should be of as large a volume as possible for securing a positive result.

Precise quantitative estimates of the cerebro-spinal fluid are valuable in assessing progress and, in addition, if carried out at definite stages are important to research. For full research autopsy examination of those patients who died should be carried out wherever possible.

Future Research

The general release of streptomycin has resulted in dispersion of cases of miliary tuberculosis and a corresponding decline in research possibilities. The hospitals originally selected should, therefore, be given every opportunity of admitting such patients if they have accommodation available.

REVIEWS AND NOTICES

Brompton Hospital Reports. Vol. xviii, 1949.

The editors, Drs. Maurice Davidson and Foster Carter, are to be congratulated on this admirable production. It consists of articles which have, for the most part, been published previously and forms a valuable compendium on recent studies in intrathoracic disease.

Comprehensive papers are included on such varied subjects as " Bronchial Carcinoma and the Surgery of Pulmonary Stenosis," by R. C. Brock; " Honeycomb Lung," by N. Oswald and T. Parkinson; " Subphrenic Abscess," by H. R. S. Harley. The place of artificial pneumothorax in pulmonary tuberculosis is clearly assessed and set down by F. H. Young in the one paper not previously published in full.

The pulmonary complications of dysphagia are described by J. R. Belcher, and other articles include a discussion of " Alveolar Cell Tumour," by R. I. McCallum; " Pneumonokoniosis due to Graphite Dust," by the late S. R. Gloyne, Geoffrey Marshall, and Clifford Hoyle

The *Proceedings of the Royal Australasian College of Physicians* for January, 1950, contains contributions which are of interest to physicians in diseases of the chest. Particularly notable in this sphere are articles on " Single Film Angiocardiography," by J. K. Maddox and E. J. Halliday; " Status Asthmaticus," by Gerald Doyle of Melbourne; and " Primary Pleural Neoplasm," by Cotter Harvey of Sydney.

We have just received the fourth annual *Report of the Northern Ireland Tuberculosis Authority* for the year ending December 31, 1949. The report of the Medical Director, Dr. B. R. Clark, is a comprehensive one with interesting observations on a wide variety of subjects such as domiciliary treatment of pulmonary tuberculosis, the Hospital Service in relation to tuberculosis, antibiotics, observations on hostel and night sanatorium accommodation for the chronic aged sick, mass radiography and the prevention of tuberculosis. The report contains also an interesting appendix on B.C.G. by Dr. Honor M. Purser.

APPOINTMENT

Dr. J. Greenwood Wilson, Medical Officer of Health, Cardiff, Glam., will take office as Chairman of the Council of the Royal Sanitary Institute on October 1, 1950.

VOL. XLIV. No. 4 OCTOBER, 1950

UNIVERSITY OF MICHIGAN
DEC 4 1950
MEDICAL LIBRARY

The BRITISH JOURNAL of TUBERCULOSIS and DISEASES OF THE CHEST

Editor: PHILIP ELLMAN

Editorial Board

CHARLES CAMERON (Edinburgh) A. BRIAN TAYLOR (Birmingham)

CLIFFORD HOYLE (London) T. HOLMES SELLORS (London)

CAMERON, CHARLES — Atypical Tuberculosis: A Case and a Discussion.

SIMON, G. — X-Ray Kymography in Intrathoracic Disease.

WEITZMAN, D., de WEND CAYLEY, F. E., WINGFIELD, ALEC L. — Streptomycin Treatment of Pulmonary Tuberculosis.

MEIKLEJOHN, A. — Advice to Pneumoconiosis Patients.

BISHOP, W. J. — Tuberculosis Stamps, Seals and Emblems.

LAWLESS, D. J. — Mobile Minor Chest Surgery Unit Service Proposals.

BALFOUR KIRK, J. — Streptomycin Treatment of Tuberculous Meningitis.

REVIEWS : NOTICES

BAILLIÈRE, TINDALL AND COX
7 & 8, HENRIETTA STREET, LONDON, W.C.2

Quarterly: single copies, 4/-, post free 4/2. Annual Subscription, 15/- (U.S.A. $3.75)

Notice to Contributors

The British Journal of Tuberculosis and Diseases of the Chest is intended for the publication of papers on all aspects of tuberculosis and cognate subjects. Papers dealing with original work are especially invited.

All manuscript and editorial communications should be sent to the Editor, Dr. Philip Ellman, F.R.C.P., 86, Brook Street, Grosvenor Square, London, W.1. Papers accepted for publication become the copyright of the *Journal* and permission for republication elsewhere must be obtained from the publishers. Papers are accepted on the understanding that they are subject to editorial revision and that they are contributed to this journal only.

Manuscripts, which should represent the final form of the material, should be typewritten in double-line spacing with wide margins. Hand-written corrections must be legible and should be kept to a minimum.

References should be cited in the text thus: Smith (1928); and the list of references given in alphabetical order at the end of the paper, thus: SMITH, X. Y. (1937): *Brit. J. Tuberc.*, **12**, 73. The titles of journals should be abbreviated according to the World List of Scientific Periodicals.

Photographs and photomicrographs should be printed on glossy paper and should, if possible, be larger than the size desired for reproduction. X-ray films should not be submitted but prints of them (preferably negative prints). The area to be reproduced (if less than the whole) of each photograph should be indicated on the back. Not more than six photographs can be accepted for any one article unless by special and exceptional arrangement. Drawings and diagrams should be done in *black* ink on Bristol board or stout white paper. Legends to illustrations should not be attached to photographs or drawings but should be typewritten on a separate sheet of paper.

One galley proof will be sent to the Author, corrections to which should be limited to verbal alterations.

All other correspondence, including orders for reprints, advertisements, etc., should be sent to the publishers:

BAILLIÈRE, TINDALL AND COX
7 & 8 Henrietta Street, W.C.2